

1. An olefin polymerization catalyst comprising:

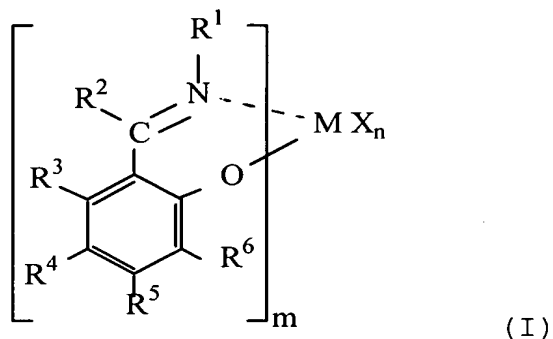
(A) a transition metal compound represented by the following formula (I), and

(B) at least one compound selected from:

(B-1) an organometallic compound,

(B-2) an organoaluminum oxy-compound, and

(B-3) a compound which reacts with the transition metal compound (A) to form an ion pair:



wherein M is a transition metal atom selected from Groups 3-7 and 11 of the periodic table,

m is 1,

R<sup>1</sup> to R<sup>6</sup> may be the same or different, and are each a hydrogen atom, a halogen atom, a hydrocarbon group, a heterocyclic compound residue, an oxygen-containing group, a nitrogen-containing group, a boron-containing group, a sulfur-containing group, a phosphorus-containing group, a silicon-containing group, a germanium-containing

group or a tin-containing group, and two or more of them may be bonded to each other to form a ring,

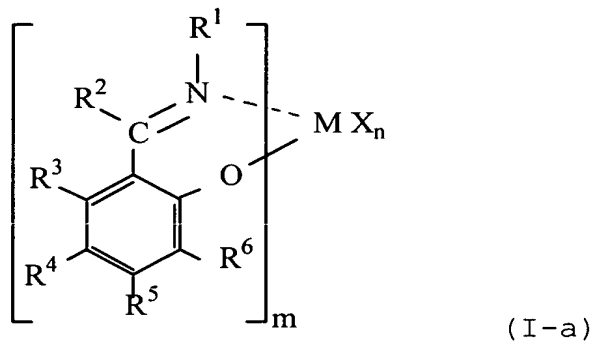
when  $m$  is 2 or greater, two of the groups  $R^1$  to  $R^6$  may be bonded to each other, with the proviso that the groups  $R^1$  are not bonded to each other,

$n$  is a number satisfying a valence of  $M$ , and

$X$  is a hydrogen atom, a halogen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group or a tin-containing group, and when  $n$  is 2 or greater, plural groups  $X$  may be the same or different and may be bonded to each other to form a ring.

2. The olefin polymerization catalyst as claimed in claim 1, wherein  $R^6$  in the formula (I) is a halogen atom, a hydrocarbon group, a heterocyclic compound residue, an oxygen-containing group, a nitrogen-containing group, a boron-containing group, a sulfur-containing group, a phosphorus-containing group, a silicon-containing group, a germanium-containing group or a tin-containing group.

3. The olefin polymerization catalyst as claimed in claim 1, wherein the transition metal compound represented by the formula (I) is a transition metal compound represented by the following formula (I-a):



wherein M is a transition metal atom selected from Groups 3-7 and 11 of the periodic table,

m is 1,

R<sup>1</sup> to R<sup>6</sup> may be the same or different, and are each a hydrogen atom, a halogen atom, a hydrocarbon group, a heterocyclic compound residue, a hydrocarbon-substituted silyl group, a hydrocarbon-substituted siloxy group, an alkoxy group, an alkylthio group, an aryloxy group, an arylthio group, an acyl group, an ester group, a thioester group, an amido group, an imido group, an amino group, an imino group, a sulfonester group, a sulfonamido group, a cyano group, a nitro group, a carboxyl group, a sulfo group, a mercapto group or a hydroxyl group, and

two or more of them may be bonded to each other to form a ring,

when  $m$  is 2 or greater, two of the groups  $R^1$  to  $R^6$  may be bonded to each other, with the proviso that the groups  $R^1$  are not bonded to each other,

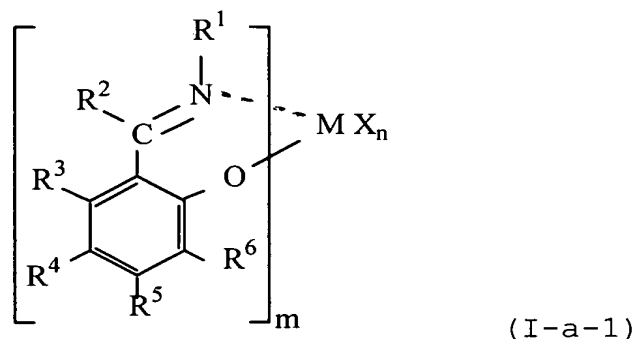
$n$  is a number satisfying a valence of  $M$ , and

$X$  is a hydrogen atom, a halogen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group or a tin-containing group, and when  $n$  is 2 or greater, plural groups  $X$  may be the same or different and may be bonded to each other to form a ring.

4. The olefin polymerization catalyst as claimed in claim 3, wherein  $R^6$  in the formula (I-a) is a halogen atom, a hydrocarbon group, a heterocyclic compound residue, a hydrocarbon-substituted silyl group, a hydrocarbon-substituted siloxy group, an alkoxy group, an alkylthio group, an aryloxy group, an arylthio group, an acyl group, an ester group, a thioester group, an amido group, an imido group, an amino group, an imino group, a

sulfonester group, a sulfonamido group, a cyano group, a nitro group, a carboxyl group, a sulfo group, a mercapto group or a hydroxyl group.

5. The olefin polymerization catalyst as claimed in claim 1, wherein the transition metal compound represented by the formula (I) is a transition metal compound represented by the following formula (I-a-1):



wherein M is a transition metal atom selected from Groups 3-7 and 11 of the periodic table,

m is 1,

R<sup>1</sup> to R<sup>6</sup> may be the same or different, and are each a hydrogen atom, a halogen atom, a hydrocarbon group, a heterocyclic compound residue, a hydrocarbon-substituted silyl group, a hydrocarbon-substituted siloxy group, an alkoxy group, an alkylthio group, an aryloxy group, an arylthio group, an acyl group, an ester group, a thioester group, an amido group, an imido group, an amino

group, an imino group, a sulfonester group, a sulfonamido group, a cyano group, a nitro group or a hydroxyl group, and two or more of them may be bonded to each other to form a ring,

when  $m$  is 2 or greater, two of the groups  $R^1$  to  $R^6$  may be bonded to each other, with the proviso that the groups  $R^1$  are not bonded to each other,

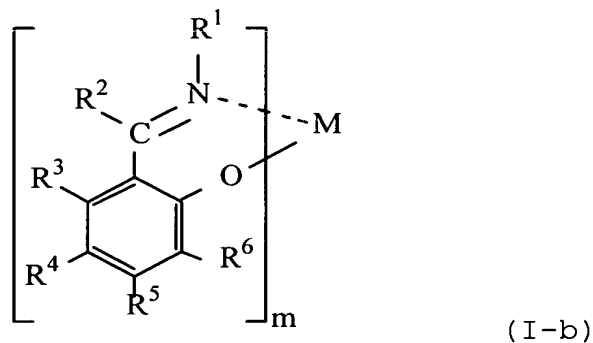
$n$  is a member satisfying a valence of  $M$ , and

$X$  is a hydrogen atom, a halogen atom, a hydrocarbon group of 1 to 20 carbon atoms, a halogenated hydrocarbon group of 1 to 20 carbon atoms, an oxygen-containing group, a sulfur-containing group or a silicon-containing group, and when  $n$  is 2 or greater, plural groups  $X$  may be the same or different and may be bonded to each other to form a ring.

6. The olefin polymerization catalyst as claimed in claim 5, wherein  $R^6$  in the formula (I-a-1) is a halogen atom, a hydrocarbon group, a heterocyclic compound residue, a hydrocarbon-substituted silyl group, a hydrocarbon-substituted siloxy group, an alkoxy group, an alkylthio group, an aryloxy group, an arylthio group, an acyl group, an ester group, a thioester group, an amido group, an imido group, an amino group, an imino

group, a sulfonester group, a sulfonamido group, a cyano group, a nitro group or a hydroxyl group.

7. The olefin polymerization catalyst as claimed in claim 1, wherein the transition metal compound represented by the formula (I) is a transition metal compound represented by the following formula (I-b):



wherein M is a transition metal atom selected from Groups 3-7 and 11 of the periodic table,

m is 1,

R<sup>1</sup> to R<sup>6</sup> may be the same or different, and are each a hydrogen atom, a halogen atom, a hydrocarbon group, a hydrocarbon-substituted silyl group, an alkoxy group, an aryloxy group, an ester group, an amido group, an amino group, a sulfonamido group, a cyano group or a nitro group, and two or more of them may be bonded to each other to form a ring, and

when m is 2 or greater, two of the groups  $R^1$  to  $R^6$  may be bonded to each other, with the proviso that the groups  $R^1$  are not bonded to each other.

8. The olefin polymerization catalyst as claimed in claim 5, wherein  $R^6$  in the formula (I-b) is a halogen atom, a hydrocarbon group, a hydrocarbon-substituted silyl group, an alkoxy group, an aryloxy group, an ester group, an amido group, an amino group, a sulfonamido group, a cyano group or a nitro group.

9. The olefin polymerization catalyst as claimed in claim 1, wherein M in the transition metal compound (A) is a transition metal atom selected from Group 3 of the periodic table.

10. The olefin polymerization catalyst as claimed in claim 1, wherein M in the transition metal compound (A) is a transition metal atom selected from Group 4 of the periodic table.

11. The olefin polymerization catalyst as claimed in claim 1, wherein M in the transition metal compound (A) is a transition metal atom selected from Group 5 of the periodic table.

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.



12. The olefin polymerization catalyst as claimed in claim 1, wherein M in the transition metal compound (A) is a transition metal atom selected from Group 6 of the periodic table.

13. The olefin polymerization catalyst as claimed in claim 1, wherein M in the transition metal compound (A) is a transition metal atom selected from Group 7 of the periodic table.

14. The olefin polymerization catalyst as claimed in claim 1, wherein M in the transition metal compound (A) is a transition metal atom selected from Group 11 of the periodic table.

15. A method for polymerizing olefin using the olefin polymerization catalyst as claimed in any one of claims 1 to 14.